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female cat would encounter in the prosecution of their amours, and that therefore if such a monstrous union were possible, the marriage must be between a cat and female raccoon. But until most cogent evidence is adduced, I must remain sceptical as to the possibility of any fruitful union whatever.

Of course, no reflection is cast upon the eminent gentlemen who published the account of the remarkable animal, and who have only repeated what they heard; they, probably not being very familiar with the order of mammals in question, naturally believed in and reflected the opinions of others. My only object in this communication is to elicit more evidence while it may readily be obtained, and I may be allowed to express the hope that when the animal — happily for the interest of science! — dies, it may be reserved for a more worthy fate than to leave its skin stuffed for a museum: it should, of course, be submitted to the examination of a critical anatomist.

In conclusion, a few words respecting the nature of the evidence required in alleged cases of hybridity may be serviceable. In view of the constant statements respecting hybrids circulated in various publications, affirmations and beliefs are not sufficient. Hybrids partake of characters peculiar to each parent, but modified by the sex of each parent. Therefore, all the men of China, Me., might swear they saw a cat and raccoon *in coitu* (and in view of the strength of the sexual instinct, the allegation might not be wholly incredible), and all the men of Taunton might swear that they believed that the offspring of one of the animals was the result of such amours (and in view of the credulity of man and the general ignorance respecting nature, the *reality* of such *belief* would be quite credible!) but all such affirmations and beliefs would not meet the requisites of the case, *unless* the offspring shared characteristics of each parent, and even if it were further sworn that the female had been precluded from intercourse with another animal, it would be no further evidence, for unless the allegation was confirmed by the characteristics of the animal, we would still have infallible nature against truthful and at least fallible man. — THEODORE GILL.

GEOLOGY.

GEOLOGY OF THE PHOSPHATE BEDS OF SOUTH CAROLINA. — Dr.

A. S. Packard, Jr., made some remarks on the geology of the phosphate beds of South Carolina. During a recent visit to Charleston, he had observed the phosphate diggings on the Ashley river, and at a locality on the northeast railroad eight miles from Charleston, but through the courtesy of C. C. Coe, Esq., Superintendent of the Marine and River Phosphate Mining and Manufacturing Company, and Dr. C. U. Shepard, Jr., he had enjoyed special facilities for studying the Quaternary, or Post Pliocene formation in which the phosphate bed occurs, having made two excursions in company with these gentlemen on the Company's steamer Gazelle. He was also indebted to Prof. C. U. Shepard, Sr., for much valuable information regarding the chemical as well as geological history of these interesting beds. Analogous beds have been discovered in the later tertiary of England near Cambridge, but they are becoming exhausted, and manufacturers of superphosphates are now importing large quantities of the crude phosphate rock from Charleston, S. C., as well as the phosphate, or apatite, rock from the Laurentian formation of Canada, which Dr. T. Sterry Hunt, the distinguished chemist of the Canadian Geological Survey, believes to have resulted largely from the decomposition of shells, especially those of Lingula.

The phosphate beds of South Carolina are spread over an area along the coast one hundred miles along, and about twenty miles in breadth; the formation is not continuous, being sometimes, as stated (in conversation) by Prof. C. U. Shepard, Jr., replaced by ferruginous sand. It has already been largely used as a fertilizer for worn out lands of the Sea Island cotton region, and promises from the unlimited supply of the rock, to become a large industrial interest of the state, six million dollars having already been invested in lands and mining and manufacturing materials by northern capitalists alone.

The relation of the phosphate beds to the Quaternary formation of the state and of the latter to the glacial beds of sand and clay of the northern states, were, however, the principal points he would allude to. At a celebrated locality of Quaternary fossils at Simmon's Bluff on Wadmalaw Sound, about thirty miles by steam from Charleston, he made with the kind and generous aid of Dr. Shepard, Jr., a large collection of fossils, from a bed of sand and mud about four feet in thickness. This bed corresponded with the marine clays of New England and Labrador, and the ancient sea bottom with its multitude of shells, which remained just as they had died in their holes, reminded him of an ancient raised sea-bottom at Hopedale, Labrador.

These clay beds graduated into clay and sand, containing a ferruginous layer, supposed by Dr. Shepard, Jr., to be the horizon of the phosphate beds. These beds correspond to the beds of clay at Gardiner, Maine, where Sir Charles Lyell discovered the bones of the Bison and Walrus. They contain bones of the Megalonyx, Mastodon, Elephant, Tapir, two species of Horse, Peccary, Rhinoceros and Manatee. The sands graduate into the beach sands of the close of the Quaternary, just as do the Bison and Walrus beds of the Kennebec river. The phosphate beds, then, were probably rolled masses of Eocene rock crowded with shells, mingled with the bones of the animals above mentioned, deposited and arranged by the waves of a shallow sea a few feet deep. This sea was much shallower even than that which covered the ancient sea bottom beneath, which must have been only from one to five or ten fathoms deep, as the same shells are at the present day thrown up on the neighboring beaches in great abundance, and he had dredged some of them at a depth of from five to thirty feet at Beaufort, N. C.

After their deposition, the carbonate of lime of the shell marl of the Eocene rocks had been replaced by phosphate of lime. How this had been effected, and whence the phosphate of lime was derived, was a question still unsettled by chemists. He alluded to the theory of Prof. Shaler that this phosphate deposit had been formed at the bottom of the Gulf Stream, which, according to that geologist, had probably flowed over the site of the present phosphate beds; and in opposing the theory suggested that the phosphate beds were deposited in shallow water, perhaps lagoons as suggested by Prof. Holmes, as they rested in a shallow water deposit above alluded to. There was no apparent evidence, as well shown by the facts published by Tuomey in his geological survey of South Carolina, of a depression of the coast. On the other hand there is no apparent evidence of glacial action on the coast, since the Quaternary sands are marine or aerial, and Tuomey states that he has nowhere in the state of South Carolina seen any angular blocks, nor a pebble a foot in diameter. Moreover, the life of the Quaternary in this state indicated even a warmer climate than at present obtains.

Since these remarks were made, he had met by accident with the paper by Desor, than whom no one can speak with greater authority, in which he has made a comparison* between the glacial marine beds of the North and the marine coast deposits of the Southern states, parallelizing the deposits in a masterly manner. His remarks entirely confirm the views given above. One difficulty Desor had in parallelizing the Laurentian beds of the North with those of the South containing the remains of land animals, was the apparent absence of the remains of land animals in the clays of the North, but since then teeth of the bison have been found at Gardiner, Maine, in the upper part of the clays. It may also result from farther investigation that the phosphate beds were laid down at a later period than we have supposed; at the time when the great mammals found in the cave at Phœnixville by Mr. Wheatley flourished, perhaps during the earlier portion of the river terrace period when the mammoth and mastodon lived both in the northern and southern states.

Thus, the parallelism between the Quaternary beds North and South would seem to be even more exact than Desor twenty years ago could make it with his data. The climate gradually grew warmer from Labrador to Florida; the Gulf Stream did not apparently change its bed during the Quaternary period; the oscillations of level of the coast of South Carolina were slight and involved but a few feet, where in Canada and Labrador the rise and fall involved several hundreds; and the denudation effected in the North by land ice, was caused in the South by oceanic currents, waves and atmospheric agencies. There are apparently no facts to show that while the glaciers lined the coast of New England, the waters of South Carolina were not as warm, if not warmer, than at the present day, from the effects of the Gulf Stream. — *Bulletin Essex Institute.*

DEEP SEA EXPLORATIONS. — The expedition by the Coast Survey, under the charge of Professor Agassiz and Count Pourtales, to explore the sea at great depths in the Southern Atlantic and along the Pacific coast, revives the interest in the remarkable discoveries made by the late English deep-sea dredging explorations in the Mediterranean Sea. It seems, as "Nature" remarks, that Humboldt, as long ago as 1812, maintained that such a low temperature exists at great depths in tropical seas as can only be accounted for by the hypothesis of undercurrents from the Poles to the Equator. The temperature soundings taken on the last English expedition show that the bottom of the sea off Portugal, below one thousand fathoms, ranges from thirty-nine to thirty-five degrees, or about the freezing point. In the Mediterranean the temperature beneath the hot surface stratum of water is uniform to any depth—namely, about fifty-five degrees. It is naturally inferred that in the Atlantic and Pacific oceans an undercurrent of polar icy water is flowing southward under the warmer tropical waters; and this is sustained by the discovery at great depths of polar animals in the seas of Florida and Cuba. The English expedition under Professor Carpenter, the well known physiologist, has also detected the existence of an outward undercurrent in the Strait of Gibraltar, which carries back into the Atlantic the water of the Mediterranean that has undergone concentration by the excess of evaporation in its basin. Professor Carpenter confirms the theory previously urged by Captain Maury, that the cause of the superficial in-current and the deep out-current is to be found in the excess of evaporation, the Mediterranean water being from evaporation denser than the water of the Atlantic. Carpenter then compares the polar and equatorial areas, and shows that there is a tendency in the former to a lowering of level and increase of density, which places it in the same relation to the latter as the Mediterranean bears to the Atlantic.

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*Post Pliocene of the Southern states and its relation to the Laurentian of the North and the deposits of the valley of the Mississippi. By E. Desor. American Journal Science and Arts. 1852. Vol. 14. p. 49.

COAL BEDS IN PANAMA.—In a paper read before the Geological Section of the British Association, Dr. Hume stated that, during a recent residence upon this isthmus, he learned that a series of seams of coal had been found in a secluded and primitive portion of the country, not far distant from the railway. He had procured and analyzed some specimens of the coal, and had found 75 per cent. of carbonaceous matter, the balance being water and ash, and a very small quantity of sulphur. The coal possessed a fair heating and large illuminating power.

MICROSCOPY.

ANGULAR APERTURE.—An anonymous querist in the "Monthly Microscopical Journal," incidentally to asking the aperture of a certain lens, urges the importance of angular aperture as an ele-